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Waste to Energy Conversion for a Sustainable Future

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Abstract -Air pollution, climate change, and plastic waste are three contemporary global concerns. Air pollutants affect the lungs, green gases trap heat radiation, and plastic waste contaminates the marine food chain. Two-thirds of climate change and air pollution drivers are emitted in the process of burning fossil fuels. Pollutants settle in months, green gases take centuries, and plastics take thousands of years. The most polluted regions on the planet are also the ones that are greatly affected by climate change. Air pollutants grow in most climate-change affected areas, contributing to the greenhouse effect. Smog affects local and regional transboundary countries. The biggest greenhouse gas (GHG) emitters may not be the worst-hit victims because wind and water flow distribute green gases and plastic waste worldwide. The major polluters are often rich and developed countries, and the worst affected countries are the underdeveloped poor communities. Technologically advanced countries may help the developing countries in research into removing particulate matter, green gases, and plastic waste. Intergovernmental Panel on Climate Change (IPCC) and Paris Accord have emphasized on immeasurable efforts to encourage the conversion of pollution, green gases, and plastic waste into energy. Conversion of CO2 into petrol, GHG gases into chemicals, biowaste into biofuels, plastic waste into building bricks, and concrete waste into construction materials fosters a circular economy. This work reviews existing waste to power, energy, and value-added product conversion technologies.

Key Words: Energy recovery, Waste management, Incineration, Gasification, Sustainability, Renewable energy

1.INTRODUCTION

The world faces significant challenges in managing waste and meeting energy demands sustainably. Waste-to-Energy (WtE) conversion offers a promising solution, generating energy from waste while reducing landfill waste and greenhouse gas emissions. This paper explores the potential of WtE conversion technologies, their benefits, and challenges, and discusses their role in creating a more sustainable future..

2. Body of Paper

Waste-to-Energy Conversion Technologies :

1. Incineration: Burning waste to produce electricity or heat.
2. Gasification: Converting waste into synthesis gas (syngas) for energy production.
3. Pyrolysis: Thermally decomposing waste to produce energy-rich products.
4. Anaerobic digestion: Breaking down organic waste to produce biogas.

Benefits of Waste-to-Energy Conversion:

1. Renewable energy source: WtE reduces dependence on fossil fuels.
2. Waste reduction: WtE decreases landfill waste and minimizes environmental impacts.
3. Greenhouse gas reduction: WtE can reduce net greenhouse gas emissions.
4. Economic benefits: WtE creates jobs and stimulates local economies.

Challenges and Limitations:

1. Air pollution: WtE facilities must manage emissions and air quality.
2. High capital costs: Implementing WtE technologies can be expensive.

3. Public perception: Community acceptance and awareness are crucial.

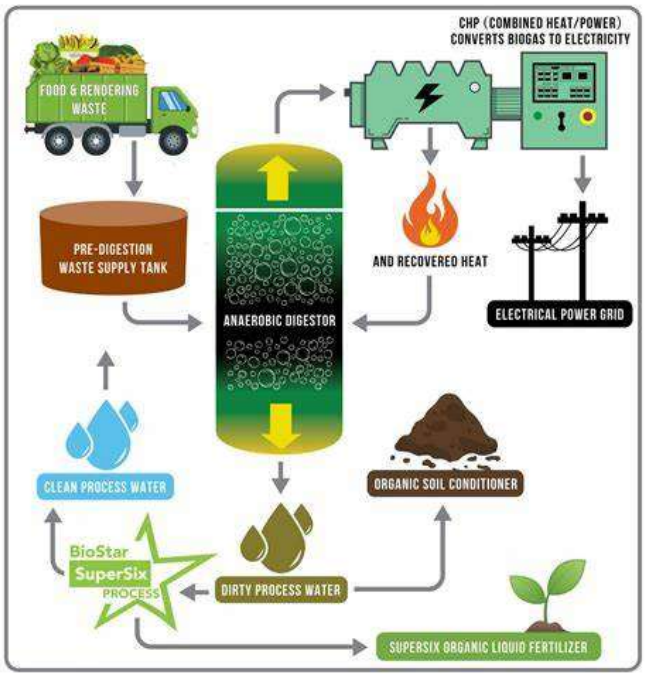
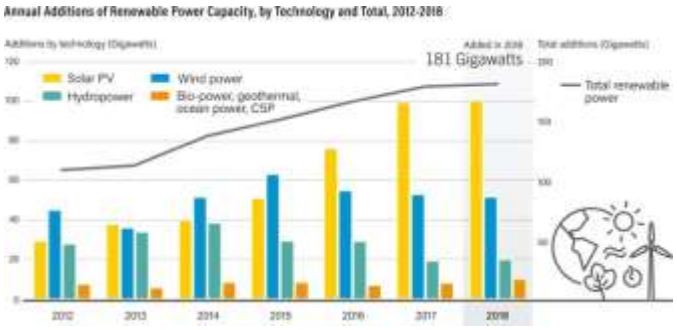


Fig -1(Waste To Energy Conversion)

Charts :



3. CONCLUSIONS

Waste-to-Energy conversion offers a promising solution for sustainable waste management and renewable energy production. While challenges exist, the benefits of WtE conversion make it an attractive option for reducing waste, generating energy, and mitigating climate change. As technology advances and economies of scale improve, WtE is likely to play an increasingly important role in creating a more sustainable future.

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